

HORN ISLAND PASS, MISSISSIPPI.

---

L E T T E R

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORTS OF  
EXAMINATION AND SURVEY OF HORN ISLAND PASS, MISSIS-  
SIPPI.

---

FEBRUARY 3, 1904.—Referred to the Committee on Rivers and Harbors and ordered  
to be printed.

---

WAR DEPARTMENT,  
*Washington, February 3, 1904.*

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, of yesterday's date, together with copies of reports and a supplemental report from Capt. W. E. Craighill, Corps of Engineers, dated June 9, November 7, and December 26, 1903, respectively, on a preliminary examination and survey of Horn Island Pass, Mississippi, made by him in compliance with the provisions of the river and harbor act of June 13, 1902.

Very respectfully,

WM. H. TAFT,  
*Secretary of War.*

THE SPEAKER OF THE HOUSE OF REPRESENTATIVES.

---

WAR DEPARTMENT,  
OFFICE OF THE CHIEF OF ENGINEERS,  
*Washington, February 2, 1904.*

SIR: I have the honor to submit herewith reports dated June 9 and November 7, 1903, by Capt. W. E. Craighill, Corps of Engineers, on preliminary examination and survey, respectively, of Horn Island Pass, Mississippi, with a view to securing a channel 25 feet deep and of suitable width, together with a supplemental report of December 26,

1903, made in pursuance of a requirement of the river and harbor act of June 13, 1902.

In the opinion of Captain Craighill, concurred in by the division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, the interests involved at Horn Island Pass are sufficiently large to render the locality worthy of improvement by the General Government, provided effective results can be accomplished within a reasonable limit of cost.

In his report on survey the district officer presents a plan for improvement which contemplates the formation of an anchorage basin 600 feet wide by 3,000 feet long and 24 feet deep behind Horn Island Pass, a connecting channel between the anchorage basin and the throat of the pass 24 feet deep and 200 feet wide, and a 25-foot channel 300 feet wide across the outer bar, at an estimated cost of \$225,000, which includes \$55,000, one-half the estimated cost of building a dredge for use on this and other works in the same district. In forwarding this report, the division engineer expresses the opinion that the present and prospective commerce does not justify the Government in incurring the expense of forming and maintaining a channel 25 feet deep through Horn Island Pass.

These reports have been reviewed by the Board of Engineers for Rivers and Harbors under the provisions of sections 3 and 14 of the above-mentioned act, and attention is invited to the Board's reports on the subject in indorsements of July 11, and December 15, 1903, and of January 5, and January 30, 1904; also to the supplemental estimate, prepared by Captain Craighill at the instance of the Board, the cost of a 21-foot channel through Horn Island Pass on the lines laid down in his report on survey.

This locality has heretofore been improved by the United States by dredging a channel 200 feet wide with a depth from 20 to 20½ feet, and there is now a depth of 18 feet through Horn Island Pass connecting the harbor with deep water in the Gulf. The Board of Engineers states in its report of December 15, 1903, that it is not believed that the act of June 13, 1902, contemplated the deepening of the harbor proper and that the improvement of the pass to a greater depth than 21 feet would serve no useful purpose. It concludes in its later report of January 30, 1904, that in view of the facts summarized therein it is advisable to provide through Horn Island Pass a channel 21 feet in depth, 300 feet wide across the outer bar and 200 feet wide elsewhere, connecting the natural anchorage with the deeper water of the Gulf to be accomplished by the use of a Government plant, to be temporarily loaned from some other improvement, at an estimated first cost of \$40,480, and \$9,000 annually for maintenance.

I agree with the opinion that it is inadvisable to expend on this improvement so large a sum as the estimated cost of a 25-foot channel and anchorage basin, and that it is advisable to provide a 21-foot channel if this can be effected at the price of 11 cents per cubic yard named by the Board. This price is much less than any probable bid if the work be let by contract, since contractors' plants are not usually equipped for bar dredging. The amount of work at Horn Island does not justify the construction of a special plant, and it appears that the only way of bringing the work within the estimate is to do it with Government plant belonging to some other improvement, borrowed for this work at some time when it would otherwise be idle. It can not be stated with certainty when such a plant will become available

in this manner, and for this reason the improvement must wait a favorable opportunity for its execution, and if money be appropriated for it, it should be with the understanding that the funds must remain unexpended until the necessary plant belonging to some other improvement can be spared from its work elsewhere.

With this statement, I concur in the views of the Board.

Very respectfully, your obedient servant,

A. MACKENZIE,  
*Brig. Gen., Chief of Engineers, U. S. Army.*

Hon. WILLIAM H. TAFT,  
*Secretary of War.*

---

PRELIMINARY EXAMINATION OF HORN ISLAND PASS, MISSISSIPPI.

ENGINEER OFFICE, UNITED STATES ARMY,  
*Mobile, Ala., June 9, 1903.*

GENERAL: In compliance with instructions contained in Department letter dated July 12, 1902, I have the honor to submit the following report upon the preliminary examination of Horn Island Pass, Mississippi, with a view to a channel of 25 feet depth and suitable width, provided for by the river and harbor act of June 13, 1902.

Examinations of this locality have been made as follows:

In 1882 (see Annual Report of the Chief of Engineers for 1882, p. 1324); a survey in 1896 (see Annual Report of the Chief of Engineers for 1897, p. 1716); a survey in 1898 (see Annual Report of the Chief of Engineers for 1899, p. 1784).

Under the provisions of river and harbor acts of August 18, 1894, and June 3, 1896, a channel 200 feet wide, with depths of from 20 to 20½ feet was dredged. A survey made about fifteen months after the completion of this work showed that the channel had shoaled to a depth of 19 feet in that space of time. The shoaling, however, occurred only at isolated points in the channel, and the pilots claim that it was caused by the grounding of vessels in the cut.

The business interests concerned in the improvement of Horn Island Pass are principally lumber shippers at Scranton, Mosspoint, and East Pascagoula, Miss. In many cases they now find it necessary to load heavy vessels at Ship Island because of the lack of sufficient depth of water on the bar at Horn Island Pass. The harbor at Horn Island would be better for them than the one at Ship Island, both on account of the shorter haul, and because at Horn Island, on account of the local conditions, a less amount of lumber is lost in loading the ships. It is estimated by the Pascagoula Commercial Club that about \$56,000 a year would in this way be saved to the lumber interests, by being able to load at Horn Island instead of at Ship Island. The annual exports by water from points that would use Horn Island Pass if it were sufficiently improved amount to about 162,000,000 feet of lumber. It is probable, in my opinion, that this channel could be maintained by a seagoing dredge, whose time would be distributed between it, Mobile bar, and Ship Island Pass.

I am of the opinion that the interests involved at Horn Island Pass are sufficiently large to render the locality worthy of improvement by

the General Government, provided effective results can be accomplished within a reasonable limit of cost. As the probable cost of the work can only be determined after a complete survey and after an investigation of the most economical method of performing the work, including the possibility of securing Government plant for its execution, I recommend that the necessary surveys be authorized at a cost not to exceed \$1,500.

The following extracts are from the report of Assistant Engineer David G. Anderson, and give the physical characteristics of the locality and other interesting data:

I have the honor to submit the following report upon a preliminary examination of Horn Island Pass, Mississippi, with a view to a channel of 25 feet depth and suitable width, made in compliance with a provision contained in the river and harbor act of June 13, 1902. This examination was completed in accordance with your instructions on May 18, 1903, the general information regarding this locality having been obtained at various times prior to that date.

*Geographical location.*—The Gulf coast of the State of Mississippi and of a part of the State of Alabama is protected by a chain of islands stretching east and west, parallel to the mainland and about 8 or 10 miles distant therefrom. The body of water intervening between these islands and the mainland is called Mississippi Sound and extends from Mobile Bay on the east to Lake Borgne on the west. The waters of Mississippi Sound are protected to a great extent by the chain of islands referred to, and although the general depths in the sound are shoal yet just north of two of the islands there are sheltered anchorage sites with low-water depths ranging from 18 to 30 feet. These anchorages connect with the Gulf of Mexico by means of passes between the islands, and for want of natural deep-water harbors along the mainland in this immediate vicinity the pockets in question have been and are extensively used as loading points for deep-draft vessels. The names of these two anchorages are Ship Island Harbor and Horn Island Harbor, the latter being just north of Horn Island, while between the latter island and Petit Bois Island and some 7 miles west of the Alabama-Mississippi State line is Horn Island Pass, which is now under examination.

*Physical characteristics.*—The channel through Horn Island Pass has all the characteristics of an ocean inlet. Petit Bois Island to the eastward has a length of about 12½ miles, while Horn Island to the westward has an extent of 15 miles, the opening between them being about 1½ miles wide. The waters of Mississippi Sound in this vicinity evidently set toward the south on the ebb tide until the currents are deflected, concentrated, and trained along the northern shores of the islands, thereby producing deep water at these localities. The currents from the pockets finally round the ends of the islands and flow through the pass into the Gulf of Mexico.

A careful comparison of Coast Survey charts of various dates shows that the depths through Horn Island Pass have been gradually increasing for some years past. The earliest accessible hydrography of this vicinity, that of 1860, shows minimum depths of 14 to 15 feet across the bar. In 1873 these depths had increased to 16 or 17 feet; in 1896 there was reported to be 18½ feet, while at the present time there is believed to be 19 or 19½ feet of water in it. Upon investigation it can be seen that this deepening is caused by the contraction of the pass opening, due to the steady growth of Petit Bois Island toward the west. While the eastern end of Horn Island shifts its position from time to time, this portion of the island has not cut away as rapidly as the western end of Petit Bois Island has advanced, so that while the opening between these islands was over 3 miles wide in 1860, in 1896 it had diminished to perhaps 1½ miles. The comparison also shows, as might be expected in the case of an ocean bar, that the channel shifts its location from time to time, under the influence of the forces which are at work in this vicinity. Owing to the fact that the ebb current flowing along the north side of Horn Island is toward the east, while the littoral currents outside the bar are toward the west, the channel of the pass has generally followed a curved path, the concavity, of course, being toward the west. The data at hand are not sufficient to determine the oscillations in width and depth, or the range in the position of the channel, which are included in the cycle of changes in progress at this locality. In its present condition the pass consists of an outer bar and an inner bar separated by a deeper pocket immediately between the ends of the adjacent islands. The minimum depths over the outer bar are about 19 to 19½ feet, while over the inner bar they are slightly greater. In the intervening area of deep water the soundings run up to 25 or 27 feet. The distance from the eastern end of the Horn Island anchorage to deep water in the Gulf of Mexico, following the exist-



ing channel, is about 3 miles, and quite an extent of this distance will probably require dredging in order to obtain a 25-foot channel.

\*       \*       \*       \*       \*       \*       \*

*Resources, industries, and commerce.*—Horn Island Harbor is 9 miles south of the mouth of the Pascagoula River and is the natural outlet for the commerce of that stream. The Pascagoula River is tributary to an extensive area of yellow-pine forest lands in the southeastern part of the State of Mississippi. Extensive sawmills are located on the lower part of the river, and the pine logs, after being floated down the river to the mills, are manufactured into lumber and timber for shipment by water to coastwise or foreign ports. The lower Pascagoula River has a present depth of about 12 feet, so that small vessels load their cargoes directly at the mills. Larger vessels take on their cargoes in the lower sound, off the mouth of the river and in Horn Island Harbor, the lumber being shipped out to the loading point on barges or in rafts, but deep-draft vessels loading cargoes from the Pascagoula mills are obliged to seek Ship Island anchorage, 20 or 25 miles to the westward, owing to lack of depth through Horn Island Pass. At Ship Island vessels up to about 25 or 26 feet draft can be loaded, whereas the maximum possible draft that can be carried through the pass at Horn Island is 20½ feet. The long tow to Ship Island, in conjunction with the fact that a portion of the distance, between the ends of Horn and Ship islands, is considerably exposed, makes the transportation of lumber and timber on barges or in rafts to that place expensive, uncertain, and more or less hazardous. It is with a view of saving the expense of the long and uncertain tow to Ship Island that the interests of the Pascagoula River desire the deepening of Horn Island Pass, in order to permit deep-draft vessels to have access to Horn Island Harbor. The present project for the improvement of the Pascagoula River contemplates the formation of a 17-foot channel.

With the completion of this channel and the deepening of Horn Island Pass deep-draft vessels could take on a large portion of their cargoes at the mills, finish loading at Horn Island, and proceed directly to sea with a minimum expense for loading. The lumber interests at this locality are predominant and represent practically the entire business that would be directly affected by the improvement of Horn Island Pass. Full figures in regard to the commerce of the Pascagoula River and various arguments in favor of the improvement of Horn Island Pass are given in the accompanying statements, which have been prepared by the Pascagoula Commercial Club. Attention is respectfully invited to these papers for a full statement of the facts bearing upon the improvement of Horn Island Pass. An analysis of these figures shows that for the fiscal year ending June 30, 1902, the business of the Pascagoula mills amounted to about 178,000,000 feet B. M. of lumber and timber. Of this amount some 16,000,000 feet were shipped by rail, while the remaining amount, 162,000,000 feet, were shipped by water. A little less than one-half the water shipments passed through the Horn Island channel, while the balance of the exports, amounting in value to \$1,000,000, were loaded in deep-draft vessels, which were obliged to take on their cargoes at Ship Island. As is shown by the Commercial Club's statement, the tow to Ship Island is uncertain, expensive, and acts in various ways as a handicap to the business of Pascagoula River.

*Nature of improvement desired.*—A channel about 400 to 600 feet wide and 25 feet deep at mean low water is desired by the navigation interests using Horn Island Harbor. An examination of the Horn Island anchorage shows that there is but one 25-foot pocket in the whole extent of the anchorage and that this pocket is but one-quarter of a mile long. Without an immense amount of excavation the harbor itself could not be made available for 25-foot vessels. Owing to this circumstance, and to the fact that vessels in a seaway on an ocean bar require a safe margin of depth under their keels, it is believed that the navigation interests of Horn Island Pass are asking for a consideration of the merits of a project for affording loading and navigation facilities for vessels up to a draft of about 23 feet. Such a plan of improvement would be possible, as a small 23-foot pocket exists at the eastern end of Horn Island anchorage. Any deep channel through the pass will, however, require the improvement of the anchorage in order to be of complete benefit, as the general depths therein are only from 20 to 23 feet. As to the width of the channel, it is believed the cut through the pass need not be over 300 feet wide, this being the extent of the dredging performed at Ship Island and also the contemplated width of the channel across the outer bar of Mobile Harbor. The material to be removed is generally a hard sand, with possibly some mud, and the conditions of the work are such that it could not be performed economically by any other than a plant especially adapted for work in exposed localities; that is, by seagoing hydraulic dredges. Being exposed to the wind from practically all quarters, the bar is usually rough, except during certain changes in the weather, and the prosecution of the work with ordinary plant is therefore difficult.

The work previously performed under contract at Horn Island Pass in 1897 commanded a price of 40 cents per cubic yard, while the contract work in the anchorage in 1899-1901 brought 34 cents per cubic yard. Similar prices would make the performance of any further work at this locality unwarranted, but if the dredging can be performed by Government plant or otherwise at an economical rate the project appears deserving.

Respectfully submitted.

W. E. CRAIGHILL,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*  
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, GULF DIVISION,  
*New Orleans, La., July 2, 1903.*

Respectfully forwarded to the Chief of Engineers, United States Army, concurring in the opinion of the district engineer officer that the interests involved at Horn Island Pass, Mississippi, are sufficiently large to render the locality worthy of improvement by the General Government, provided effective results can be accomplished within a reasonable limit of cost, and also concurring in his recommendation that the necessary surveys be authorized at a cost not to exceed \$1,500.

H. M. ADAMS,  
*Lieut. Col., Corps of Engineers,*  
*Division Engineer.*

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,  
*July 8, 1903.*

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

A. MACKENZIE,  
*Acting Chief of Engineers.*

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,  
*Washington, D. C., July 11, 1903.*

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer upon a preliminary examination of Horn Island Pass, Mississippi, "with a view to a channel of 25 feet depth and suitable width," the indorsement of the division engineer thereon, and other data available.

The Board is of the opinion that the present and prospective commerce of Horn Island Harbor is such as to render advisable the improvement of Horn Island Pass, provided such improvement can be effected at reasonable cost. The Board recommends that the district officer be authorized to make a survey and estimate of cost, and that for these purposes he be allotted the sum of \$1,500.

For the Board:

H. F. HODGES,  
*Major, Corps of Engineers,*  
*Senior Member Present.*

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,  
*July 20, 1903.*

Respectfully submitted to the Secretary of War.

This is a report on preliminary examination of Horn Island Pass, Mississippi, authorized by the river and harbor act approved June 13, 1902.

Inviting attention to the report of the Board of Engineers for Rivers and Harbors, in the preceding indorsement, I recommend that a survey of the locality as proposed be authorized.

A. MACKENZIE,  
*Acting Chief of Engineers.*

[Fifth indorsement.]

WAR DEPARTMENT,  
*July 29, 1903.*

Approved as recommended by the Acting Chief of Engineers.  
 By order of the Secretary of War:

J. B. RANDOLPH,  
*Acting Chief Clerk.*

[Sixth indorsement.]

WAR DEPARTMENT,  
 OFFICE OF THE CHIEF ENGINEERS,  
*Washington, November 28, 1903.*

Respectfully returned to the Board of Engineers for Rivers and Harbors with report of survey as recommended.

By command of Brig. Gen. Gillespie:

H. F. HODGES,  
*Major, Corps of Engineers.*

[Seventh indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,  
*Washington, D. C., December 15, 1903.*

Respectfully returned to the Chief of Engineers, United States Army.

In addition to the within report on a preliminary examination of Horn Island Pass, Mississippi, "with a view to a channel of 25 feet depth and suitable width," the Board has had before it at its session of this date the accompanying report on a survey of this locality with estimates of cost.

The principal business interest concerned in this improvement is the lumber trade from Scranton, Mosspoint, and East Pascagoula. In many cases the heavy draft vessels have to load at Ship Island because of the lack of sufficient depth of water at Horn Island. The Pascagoula Commercial Club estimates that about \$56,000 per year would be saved to the lumber interests if Horn Island Harbor were as available as Ship Island Harbor. The annual exports that would use Horn Island if it were sufficiently improved amount to about 162,000,000 feet B. M. of lumber, about 270,000 tons.

The plan proposed by the district officer consists of the excavation of an anchorage basin 600 feet wide by 3,000 feet long and 24 feet deep behind Horn Island, a connecting channel between the anchorage basin and the throat of the pass, also 24 feet deep and 200 feet wide, and a 25-foot channel, 300 feet wide, across the outer bar. The

estimated cost of this work is \$225,000, with an annual cost for maintenance, after completion, of \$20,000. The district officer recommends the improvement of this locality to the extent indicated above.

The division engineer does not concur in the recommendations of the district officer. He states that—

From the history of this locality, it is believed that the maintenance of a 25-foot channel through the outer bar, when obtained, would be a difficult, uncertain, and expensive matter. In view of the large cost of the improvement contemplated as compared with the probable benefit to commerce, and the fact that if such a channel is dredged by the Government the benefit will be mainly local, I am unable to concur in the opinion of the district engineer that this locality is worthy of improvement by the General Government to the extent indicated. In my opinion the commercial interests, present and prospective, involved do not justify the Government in incurring the expense for forming and maintaining a channel 25 feet deep through Horn Island Pass.

Attention is invited to the fact that the United States has recently deepened the entrance to the neighboring Ship Island Harbor to 26 feet. This harbor is but 24 miles distant from Horn Island Harbor, and the two are connected by the comparatively sheltered waters of Mississippi Sound. In any case lumber must be lightered from shore points to one of these harbors, and the measure of value of the Horn Island Harbor can not be greater than the saving in the distance which lighters must be towed.

The available low-water depth in Horn Island Harbor is 21 feet. There is a depth of 18 feet through Horn Island Pass, which connects the harbor with deep water in the Gulf. It is not believed that the act of June 13, 1902, contemplated the deepening of the harbor proper, and the improvement of the pass to a greater depth than 21 feet would serve no useful purpose.

The amount of material to be removed from the pass to produce a 21-foot channel is so small that the Board believes it desirable for the United States to undertake the work. The cost of maintenance will be absolutely small, but large in relation to the original cost of the work. In submitting this recommendation the Board has weighed the cost against the commercial benefits. The Board suggests that the district officer be directed to prepare a final estimate of the cost of producing and maintaining a 21-foot channel through Horn Island Pass from the 21-foot anchorage area to deeper water in the Gulf.

For the Board:

A. M. MILLER,  
*Lieut. Col., Corps of Engineers,*  
*Senior Member Present.*

[Eighth indorsement.]

WAR DEPARTMENT,  
OFFICE OF THE CHIEF OF ENGINEERS,  
*Washington, December 21, 1903.*

Respectfully returned to Captain Craighill with request that he prepare and submit (through the division engineer) an estimate for a 21-foot channel as suggested by the Board of Engineers for Rivers and Harbors in the preceding indorsement, together with any further remarks and recommendations that he may deem proper.

By command of Brig. Gen. Gillespie:

H. F. HODGES,  
*Major, Corps of Engineers.*

[Tenth indorsement.]

WAR DEPARTMENT,  
OFFICE OF THE CHIEF OF ENGINEERS,  
*Washington, December 31, 1903.*

Respectfully returned to the Board of Engineers for Rivers and Harbors with estimate for 21-foot channel as recommended.

By command of Brig. Gen. Gillespie.

H. F. HODGES,  
*Major, Corps of Engineers.*

[Eleventh indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,  
*Washington, D. C., January 5, 1904.*

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has given consideration to the accompanying estimate of the district officer, dated December 26, 1903, for a channel 21 feet deep through Horn Island Pass, requested in seventh indorsement hereon.

In his report, dated November 7, 1903, on the survey of Horn Island Pass, the district officer submits a project and estimate of cost. He proposes to dredge—

an anchorage basin 600 feet wide by 3,000 feet long and 24 feet deep behind Horn Island; a connecting channel between the anchorage basin and the throat of the Pass, also 24 feet deep and 200 feet wide, and a 25-foot channel, 300 feet wide across the outer bar.

The estimated amount to be removed, after adding 60 per cent for bin measure and maintenance during execution of the work, is 1,600,000 cubic yards. The estimated cost of the work is—

Dredge (one-half cost).....	\$55, 000
1,600,000 cubic yards, bin measure, dredging, at 9 cents.....	144, 000
Stopping lateral channel at end of Horn Island, and contingencies.....	26, 000
Total.....	225, 000

The district officer's estimate for the work suggested by the Board, a channel 21 feet deep through the pass, is 368,000 cubic yards, scow measure, at 35 cents.....	128, 800
Contingencies.....	17, 200
Total.....	146, 000

The Board does not understand the difference in unit prices employed by the district officer in the two estimates. For example, an estimate might be stated for the work recommended by the Board, in form similar to the original estimate, as follows:

Dredge (one-half cost).....	\$55, 000
368,000 cubic yards, at 9 cents.....	33, 120
Contingencies.....	9, 880
Total.....	98, 000

And in this case there would remain to be credited to the work after its execution one-half the cost of the dredge. The Board, however, recognizes the difficulty of estimating the cost of bar dredging by contract, in view of the lack of plant in private hands available for such work.



It is recommended that these papers be sent back to the district officer with request for information on this subject, and that they be returned through the division engineer.

For the Board:

A. M. MILLER,  
*Lieut. Col., Corps of Engineers,*  
*Senior Member Present.*

[Twelfth indorsement.]

WAR DEPARTMENT,  
OFFICE OF THE CHIEF OF ENGINEERS,  
*Washington, January 8, 1904.*

Respectfully returned to Captain Craighill, with request that the further information called for by the Board of Engineers for Rivers and Harbors in eleventh indorsement hereon be furnished, with return of the papers through the division engineer.

By command of Brig. Gen. Gillespie:

H. F. HODGES,  
*Major, Corps of Engineers.*

[Thirteenth indorsement.]

ENGINEER OFFICE, U. S. ARMY,  
*Mobile, Ala., January 19, 1904.*

Respectfully returned to the Chief of Engineers, United States Army.

On account of the small amount of work to be done to get a channel 21 feet deep, I made my estimate on the assumption that the first appropriation for this improvement would not be large enough to pay for even half of a dredge, and, in addition, to operate it for the time necessary to do the work. Under this supposition it would be necessary to let the work by contract. This has been the experience with Mobile bar. The first estimate for the 25-foot channel is based on the supposition that the first appropriation would be large enough to build a dredge in connection with the improvement of Mobile Harbor and other sea bars in my district.

It would be safer and perhaps fairer for the purposes of comparison to estimate the 25-foot channel also at 35 cents per cubic yard, with the reservation that a suitable dredge belonging to the Mobile district and available for work at any point within it would very greatly reduce the cost of this and all similar improvements pertaining to this office.

W. E. CRAIGHILL,  
*Captain, Corps of Engineers.*

(Through the Division Engineer.)

[Fourteenth indorsement.]

OFFICE DIVISION ENGINEER, GULF DIVISION,  
*New Orleans, La., January 21, 1904.*

Respectfully forwarded to the Chief of Engineers, United States Army.

The river and harbor act approved June 13, 1902, requires a preliminary examination or survey to be made of "Horn Island Pass, with

a view to a channel of twenty-five feet depth and suitable width." As stated in my indorsement of November 21, 1903, in my opinion the commercial interests, present and prospective, involved do not justify the Government in incurring the expense of forming and maintaining a channel 25 feet deep through Horn Island Pass. I see no reason for changing the opinion thus expressed.

It appears that Captain Craighill has furnished the information called for by the Board of Engineers for Rivers and Harbors and by the Chief of Engineers.

H. M. ADAMS,  
*Lieut. Col., Corps of Engineers,*  
*Division Engineer.*

[Fifteenth indorsement.]

WAR DEPARTMENT,  
OFFICE OF THE CHIEF OF ENGINEERS,  
*Washington, January 27, 1904.*

Respectfully returned to the Board of Engineers for Rivers and Harbors, inviting attention to thirteenth and fourteenth indorsements hereon.

By command of Brig. Gen. Mackenzie:

H. F. HODGES,  
*Major, Corps of Engineers.*

[Sixteenth indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,  
*Washington, D. C., January 30, 1904.*

Respectfully returned to the Chief of Engineers, United States Army. It appears that to deepen the channel of entrance to Horn Island Harbor to 21 feet, if very large allowance be made for deterioration of work during its execution, the removal of 368,000 cubic yards of material will be necessary. If a Government dredge were available to do this work, the total cost would not exceed 11 cents per cubic yard, or \$40,480, and this amount will include all expenses of operation, maintenance, and deterioration of plant, insurance, interest, etc.

In view of the fact that almost no plant fit for bar dredging exists in private hands in this section of the country, it would cost perhaps 35 cents per cubic yard, or \$146,000, including administration and contingencies, to execute the work by contract.

Several United States dredges are approaching completion for work upon the South Atlantic and Gulf coasts. It is believed that from among some of the Government dredges now built or building one can, at some opportune time, be spared from the work for which it is particularly designed, to do the work at Horn Island Pass. This work would not require more than from four to six months' time. Under existing law the Secretary of War is authorized to transfer plant temporarily from one work to another under certain conditions.

The conclusions of the Board may be summed up as follows:

(a) The commerce, present and prospective, at Horn Island Harbor does not justify the excavation of a 25-foot channel at Horn Island Pass. Any increase of depth exceeding 21 feet would be of no value

unless the interior anchorage basin were also deepened, and the cost of the 25-foot channel with suitable anchorage basin is estimated at about \$218,000.

(b) The work recommended by the district officer to prevent a break in Horn Island is not considered necessary at this time.

(c) The excavation of a channel at Horn Island Pass 21 feet deep, 300 feet wide across the outer bar, and 200 feet wide elsewhere, connecting the natural anchorage with the deeper water of the Gulf, in view of resulting commercial benefits, is advisable if, to dredge the 368,000 cubic yards which must be removed, a unit price of 11 cents per cubic yard can be assumed, having in view the execution of the work by means of Government plant temporarily loaned from some other harbor.

(d) If it is impracticable to count upon the use of Government plant, the 21-foot channel above mentioned, estimated at 35 cents per cubic yard, would cost \$146,000, including administration and contingencies. It is believed that the expenditure of this sum would not be justified by resulting benefits.

(e) The cost of maintenance of the channel under consideration, if a Government dredge were available for work for a period not to exceed one month in each year, would not exceed \$9,000 annually.

In the belief that this work can be done with a Government dredge in the manner outlined above, the Board believes that an estimate of 11 cents per cubic yard may be adopted, and is of opinion that it is advisable to provide through Horn Island Pass a channel 21 feet deep, as above indicated, at a cost of \$40,480, with \$9,000 annually for maintenance.

For the Board:

R. L. HOXIE,  
*Major, Corps of Engineers,*  
*Senior Member Present.*

---

SURVEY OF HORN ISLAND PASS, MISSISSIPPI.

UNITED STATES ENGINEER OFFICE,  
*Mobile, Ala., November 7, 1903.*

GENERAL: In accordance with instructions in Department letter dated August 1, 1903, I have the honor to report the completion of the survey of Horn Island Pass, Mississippi, and to inclose herewith the report of my assistant, who had local charge of the survey, with a map<sup>a</sup> showing the present condition of the pass. A careful study has been made of conditions at this locality, as far as I have been able to ascertain them, from the records of this office and from data kindly furnished by the Coast and Geodetic Survey.

The estimate includes an anchorage basin 600 feet wide by 3,000 feet long and 24 feet deep behind Horn Island, a connecting channel between the anchorage basin and the throat of the pass; also 24 feet deep and 200 feet wide, and a 25-foot channel 300 feet wide across the outer bar. The estimated amount to be removed, measured in place, is 1,000,000 cubic yards. It is almost impossible to predict, in the

---

<sup>a</sup>Not printed.

absence of much experience at this point, the percentage which must be allowed for filling in after the dredging. For the purpose of the estimate, I have assumed that 60 per cent excess will cover the difference between place and bin measurements in addition to the filling due to the drift of the sand across the channel. The total estimate of the cost of the work is \$225,000, with an annual cost for maintenance after completion of \$20,000. The cost of maintenance would probably be less provided a dredge were available for use at this point and on Mobile bar, dividing the annual expense between the two.

The only business of any consequence using this pass is the exportation of lumber and timber to South American, European, and Atlantic coast ports. During the past two years this has amounted to \$1,644,774. It is estimated that the supply of timber will last from twenty-five to thirty years at the present rate of cutting. Much of the lumber and timber that would go out of Horn Island Pass if improved to a sufficient depth is now taken to Ship Island anchorage and loaded there, passing out to sea through Ship Island Pass. The shippers interested in this business estimate that the extra cost to them each year of using Ship Island Pass instead of Horn Island Pass is about \$55,000, based on the present annual rate of shipment. These shipments would probably be increased by the improvement of Horn Island Pass.

There has heretofore been considerable doubt as to the stability of any improvement to Horn Island Pass, but the records of recent years indicate that the pass has reached a condition of comparative stability, and that with the use of a dredge owned by the Government and always available the channel can be maintained in approximately its present position. This will involve some work on the end of Horn Island to prevent a breach at that point during heavy gales, and provision for this work has been made in the estimate.

On account of the saving to the business interests of Scranton and Pascagoula, Miss., for which the proposed improvement will provide the shortest route to sea, I am of the opinion that the pass is worthy of improvement by the General Government.

Respectfully submitted.

W. E. CRAIGHILL,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*  
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, GULF DIVISION,  
*New Orleans, La., November 21, 1903.*

Respectfully forwarded to the Chief of Engineers, United States Army.

It appears from the within report of Captain Craighill that to obtain a channel 25 feet deep and of suitable width through Horn Island Pass, Mississippi, and to provide an anchorage basin 24 feet deep behind Horn Island, would cost \$225,000, with an annual cost for maintenance after completion of \$20,000; and that the estimated saving to the local lum-

ber interests of Scranton, Mosspoint, and Pascagoula, Miss., would be about \$55,000 per annum. It also appears that the proposed improved channel will be used mainly by these lumber interests and that the present supply of timber will be exhausted at the end of twenty-five or thirty years.

From the history of this locality it is believed that the maintenance of a 25-foot channel through the outer bar, when obtained, would be a difficult, uncertain, and expensive matter. In view of the large cost of the improvement contemplated as compared with the probable benefit to commerce, and the fact that if such a channel is dredged by the Government the benefit will be mainly local, I am unable to concur in the opinion of the district engineer that this locality is worthy of improvement by the General Government to the extent indicated. In my opinion the commercial interests, present and prospective, involved do not justify the Government in incurring the expense of forming and maintaining a channel 25 feet deep through Horn Island Pass.

H. M. ADAMS,  
*Lieut. Col., Corps of Engineers,*  
*Division Engineer.*

---

REPORT OF MR. DAVID G. ANDERSON, ASSISTANT ENGINEER.

ENGINEER OFFICE, UNITED STATES ARMY,  
*Mobile, Ala., November 4, 1903.*

CAPTAIN: I have the honor to submit the following report upon a survey of Horn Island Pass, Mississippi, made in accordance with your instructions, in order to determine the feasibility, probable cost, and desirability of improving the channel of entrance through this pass from the Gulf of Mexico to Mississippi Sound.

Work on this survey was commenced on August 18, 1903, and was continued at intervals, when weather conditions permitted, until October 6, 1903, at which time the field work of the survey was completed. The plotting of the notes was commenced on September 16, 1903, the latter work, together with a study of the locality, the compilation of estimates, and the preparation of the final map, having been in progress until the present time. The purpose of the survey was to furnish a complete development of the channel through the pass, together with the hydrography of Horn Island anchorage, as well as an examination of the lateral channel extending behind Petit Bois Island. The survey included quite an extent of Horn Island anchorage to the west of Horn Island light, but, owing to the fact that the more remote portions of this anchorage would prove entirely too expensive to improve, this section of the survey has not been included in the map nor considered in the scheme for improvement.

In 1902 the adopted plane of reference in the Pascagoula River, Mississippi, which is just north of Horn Island Pass, was lowered 1 foot in order to coincide more closely with the elevation of mean low water. A corresponding adjustment of the plane of reference heretofore used at Horn Island was also found to be necessary as a result of simultaneous tidal observations at the mouth of the Pascagoula River and at Horn Island and has been introduced in the present survey. The depths of 19 or 19½ feet, referred to in the report upon the preliminary examination, will therefore become 18 or 18½ feet when referred to the new datum.

A description of the geographical location and environment of Horn Island Pass, as well as the arguments presented by the navigation interests in favor of its improvement, is set forth in the report upon the preliminary examination of this locality.

Horn Island anchorage is a narrow pocket of deep water stretching along the north side of Horn Island for a distance of about 8 miles. The anchorage basin is connected with the Gulf of Mexico by a navigable channel through Horn Island Pass. The outlet channel from the anchorage extends eastward from the eastern end of Horn Island a distance of nearly a mile, and then deflecting abruptly to the southward it passes between the ends of Horn and Petit Bois islands, and after crossing



the plateau of sand which has been deposited around the pass entrance, finally reaches deep water in the Gulf of Mexico.

The depths in the western portions of the Horn Island anchorage not shown on the map vary from 19 to 21 feet, with small pockets here and there having depths up to 25 feet. Just to the northwest of Horn Island light there is a pocket about 3,000 feet long with depths greater than 22 feet, while from the latter locality to the deep water of the pass opening a channel with depths of from about 20 to 25 feet exists. In the throat of the pass, soundings of from 25 to 31 feet are obtained until a point about 4,000 feet south of a line joining the ends of Horn Island and Petit Bois Island is reached, where the sea bar commences. As is customary on sea bars of the Gulf coast, the harbor slope is very gentle, the crest is at its extreme outer end, and the sea slope is very steep. The soundings on the sea slope increase from 18 feet on the crest to 28 feet in the short distance of 100 feet.

The present survey of Horn Island Pass has been compared with the Coast Survey charts of 1853 and 1886, and with the Engineer Department survey of 1896, in order to determine what changes have been, and are now, in progress in this locality, and to ascertain the probable effect of these changes upon the improvement proposed. From this comparison the following facts have been deduced:

(1) The width of Horn Island Pass decreased from 18,450 feet in 1853 to 8,540 feet in 1886. Since the latter date the width has shown a tendency to remain constant.

(2) The depths over the outer bar of the pass increased from 14 or 15 feet in 1853 to 18 or 18½ feet in 1886. Since the latter date the depth has remained practically constant.

(3) The position of the sharp bend in the channel between Horn Island anchorage and the Gulf of Mexico has remained almost stationary, and while Horn Island has receded from this point, Petit Bois Island has advanced toward it, the growth of the latter being more rapid than the recession of the former.

(4) The changes which have taken place in the position of the entrance channel have been confined to that portion of its extent over the sea bar to the south of the bend mentioned in the preceding paragraph. The resultant movement has been to the westward, and, while in 1853, the crest of the thalweg over the outer bar was to the east of a north and south line through the bend, at the present time it is to the west of such a line. The point where the thalweg crosses the outer bar has advanced during the past fifty years a distance of perhaps 3,750 feet in a southwesterly direction.

The following table shows some of the physical changes which have occurred since 1853:

Date of survey.	Width of cross section.	Maximum depth.	Mean depth.	Area of cross section.
	<i>Fect.</i>	<i>Fect.</i>	<i>Fect.</i>	<i>Square feet.</i>
1853.....	18,450	25	8.8	163,400
1886.....	8,540	28	15.2	129,700
1903.....	8,468	31	15.5	130,900

The dredging which was performed on the outer bar in 1897 to a depth of 20 feet at low water (19 feet referred to the present datum) has been obliterated by shoaling, but the work apparently has had the effect of retarding the westerly movement of the thalweg.

Prior to 1888 Horn Island extended close to the sharp bend in the entrance channel. In August of that year, however, a heavy gale washed away about one-half mile of the end of the island, and since that time the depths across the former site of the island have been gradually increasing. At the present time the currents flowing around the end of Horn Island have caused a breach in the shoal marking the former site of the island, and a lateral channel with over 18 feet of water in it is now advancing seaward close to the island's end.

From an examination of the shores of Horn Island it is apparent that the island is cutting away on the south side and building up on the northern. The island generally at its eastern end is narrower than formerly, and as this portion of its extent is a low, flat sand beach, devoid of vegetation and exposed to the full force of the southerly or southeasterly gales, a repetition of the breaching of 1888 is not impossible. Such a breaching, if extensive, would probably affect considerably the location of the pass channel, owing to the diminished effects of the ebb current over the site of the present channel.

Horn Island Pass is now made use of in winter time by vessels up to a draft of 19 feet, while with the higher tides of summer time a draft of 20 feet is possible at times. During the past two fiscal years, July 1, 1901, to June 30, 1903, the pass has been made use of by 400 outward-bound vessels, with cargoes, of the following drafts:

Below 10 feet .....	34
10 to 11 feet.....	66
11 to 12 feet.....	28
12 to 13 feet.....	39
13 to 14 feet.....	108
14 to 15 feet.....	39
15 to 16 feet.....	18
16 to 17 feet.....	19
17 to 18 feet.....	8
18 to 19 feet.....	17
19 to 20 feet.....	20
20 feet or over.....	4
Total .....	400

The maximum draft which has recently been carried through the pass was 20.2 feet, by the steamer *Heathfield*, in the summer of 1902. The preponderance of vessels of about 13 feet in draft is due to the fact that this is the maximum draft that can now be carried to the sawmills on the Pascagoula River, and therefore the maximum draft that can be loaded with a single handling of cargo. The 400 vessels enumerated above carried 129,611,000 feet B. M. of Mississippi pine timber, valued at \$1,644,774.

As stated in the report upon the preliminary examination of Horn Island Pass, the anchorage basin is not deep enough to make the improvement of the pass channel of benefit unless some work is done in the basin also. The most sheltered site for loading vessels at Horn Island is toward the middle of the island, but as the channel leading to this point is comparatively shallow and narrow it is not believed that the work involved would be warranted. On this account the more accessible, though less sheltered, point immediately to the northwest of Horn Island light is recommended for the site of the deep-water anchorage. An area 600 feet by 3,000 feet is proposed for this basin, with a depth of 24 feet, and in the area selected deep-draft vessels can be loaded without interfering with the passage of lighter-draft vessels to other parts of the anchorage. Between the basin and the throat of the pass a 24-foot channel, 200 feet wide, is proposed, while after widening portions of the existing deep-water pockets, removing lumps, and dredging the middle ground shoal, a 25-foot channel, 300 feet wide, across the outer bar has been estimated upon. The performance of this work will require the removal of about 1,000,000 cubic yards of material in place, or, perhaps, 1,600,000 cubic yards, bin measurement, a large coefficient being adopted to allow for shoaling during the progress of the work and for the inflow of littoral drift on the outer bar.

Two borings were made at the localities marked 1 and 2 on the map. The first of these showed a mixture of mud and sand, while the latter showed sand alone.

The performance of this amount of work will only be warranted if its execution can be accomplished at a low figure. The greatest economy in its performance can be effected by the use of a Government seagoing dredge, and this is apparently the only method by which it is practicable to undertake this improvement. A seagoing dredge is urgently needed elsewhere in this district, and it is therefore believed that the construction of such a machine would permit of the economical performance of the Horn Island work and at the same time result in an improvement of navigation facilities elsewhere in the district.

The improvement of Horn Island Pass by any other means than dredging is considered impracticable. Owing to the fact that the crest of the sea bar is 7,000 feet away from a line joining the ends of Horn and Petit Bois islands, the construction of jetties would prove very expensive, while in addition the unstable nature of these islands would make such a scheme of improvement very uncertain. An alternative scheme of dredging an entirely new outlet from Horn Island anchorage to a point toward the center of the island has been suggested. At this locality the sea slope of the island is quite steep and the distance across the island between deep water inside and outside is comparatively short. Owing to the heavy cutting that would be necessary, however, the yardage to be removed would be fully as great as by utilizing the present pass, while the results of such a plan would be decidedly problematic.

The estimated cost of the Horn Island dredging following the pass channel, on the basis of a Government dredge, one-half the cost of which is supposed to be charged to other works in this district, is as follows:

Dredge (one-half cost) .....	\$55,000
1,600,000 cubic yards of dredging (in bins), at 9 cents .....	144,000
Stopping lateral channel at end of Horn Island, engineering, etc. ....	26,000
Total .....	225,000

Owing to the changes in progress at Horn Island the lines of dredging are laid down on the map subject to revision prior to the undertaking of the work, should this improvement be provided for. During the survey current floats were attempted, to furnish information as to the best location for the dredged cuts; but owing to unfavorable conditions the results were not entirely satisfactory, except in showing the danger to be apprehended from the channel working out past the end of Horn Island.

The channel which was dredged in the anchorage basin in 1900 and 1901 has maintained itself very well, and it would therefore seem that the proposed basin and the inner end of the proposed channel will require but small future expenditures for maintenance. It is believed, too, that regulations could be established by the harbor master at Horn Island under which the ballast unloaded from incoming steamers could be disposed of in such a way as to assist in the maintenance of this portion of the project.

The channel across the outer bar, however, is exposed to the action of adverse forces and will undoubtedly need attention from time to time. The cost of maintaining this improvement after its completion is estimated at about \$20,000 annually.

The exports from Horn Island Harbor, as heretofore shown, consist entirely of lumber and timber, and as no other business will probably ever make any extensive use of the improved channel, inquiries have been made as to the probable life of the timber business in this part of the United States. Conservative mill men state that the timber lands tributary to the Pascagoula River are extensive enough to permit of an undiminished output for twenty-five or thirty years to come. Under these circumstances the improvement of Horn Island Pass by the General Government seems warranted, particularly in view of the fact that the interests involved have been considered important enough to warrant the adoption of the present project for the improvement of the Pascagoula River.

Respectfully submitted.

DAVID G. ANDERSON,  
*Assistant Engineer.*

Capt. W. E. CRAIGHILL,  
*Corps of Engineers, U. S. Army.*

#### SUPPLEMENTARY REPORT ON SURVEY.

ENGINEER OFFICE, UNITED STATES ARMY,  
*Mobile, Ala., December 26, 1903.*

GENERAL: In compliance with directions conveyed in Department indorsement dated December 21, 1903, on my report of the preliminary examination of Horn Island Pass, dated June 9, 1903, I have the honor to report that the estimated cost of a 21-foot channel through Horn Island Pass, on the lines laid down in my report of the survey of Horn Island Pass, dated November 7, 1903, is \$146,000.

The cross-section measurement of the yardage is 230,000 cubic yards, allowing 1.5 feet for overdepth in dredging. It is difficult, in the absence of experience at the locality, to estimate the amount to be added for the drift of the sand across the channel during dredging. On account of this uncertainty, I have estimated the scow measure-

ment at 60 per cent greater than place measurement. On account of the small amount of work it will probably be necessary to do this dredging by contract. Prices paid for similar work in the past have been as follows:

At Horn Island Pass, 1897-98, 40 cents per cubic yard.  
 At Horn Island anchorage, 1900-1901, 34 cents per cubic yard.  
 At outer bar of Mobile Harbor, 1903, 30 cents per cubic yard.  
 At Ship Island Pass, 1900, 22½ cents per cubic yard.

Based on this experience, I have estimated the price per cubic yard at 35 cents. In detail the estimate would then be as follows:

368,000 cubic yards, measured in the scows, at 35 cents per cubic yard ....	\$128, 800
Contingencies .....	17, 200

Total .....	146, 000
-------------	----------

Respectfully submitted.

W. E. CRAIGHILL,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

O